

## NOTES ON GEOGRAPHIC DISTRIBUTION

### **Amphibia, Plethodontidae, *Pseudoeurycea maxima*: Distribution extension.**

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Since the pioneering work of Dunn (1926), there have been numerous contributions to our understanding of the biodiversity, geography, and evolution of Neotropical salamanders of the Tribe bolitoglossine (Plethodontidae) (Wake 1987; García-París et al. 2000; Wiens et al. 2007). Dunn (1926) listed only 30 species, placing them in a single genus (*Oedipus*), a striking contrast to the currently recognized 12 genera containing some 249 species (Frost 2007). Further advances in our understanding of the diversity and biogeography of bolitoglossine salamanders will likely continue as many regions lacking extensive herpetological exploration are surveyed and more complete collections are assembled.

Amongst the Neotropical plethodontids, salamanders of the genus *Pseudoeurycea* (Taylor 1944) are noted for their wide geographic range throughout Mexico and Guatemala, occupying a diversity of ecological situations ranging from tropical deciduous and dry/wet oak-coniferous forest to tropical wet and cloud forest, and even above tree-line in alpine bunchgrass situations (e.g. Stuart 1954; Shannon and Werler 1955; Wake and Lynch 1976; Flores-Villela and McCoy 1993; Adler 1996; Parra-Olea et al. 1999; 2004; 2005; Chan 2003; Lara-Góngora 2003). Though a few species are known from low elevations (below 1500 m), the majority inhabit mid to high elevations (up to 5000 m). In addition, most species appear to occupy narrow elevational belts, a pattern seen in other genera of Neotropical salamanders (Wake 1987; García-París et al. 2000; Wake 2005).

To date, there is no thorough work reviewing the geographic distribution of the genus *Pseudoeurycea*. However, many species seem to

have limited distributions (Wake and Lynch 1976; Parra-Olea et al. 1999). An examination of the distributional data registered on the IUCN online database offers some preliminary observations. Of the 45 species of *Pseudoeurycea* evaluated by the IUCN, 34 (75 %) are known to occupy an area under 1,000 km<sup>2</sup>, and 42 % have a calculated area of occupancy under 50 km<sup>2</sup> (raw data from IUCN 2007). Although this database is often inaccurate and outdated, and should thus be treated with caution, its data suggests that many salamanders of this genus may have exceptionally small geographic ranges.

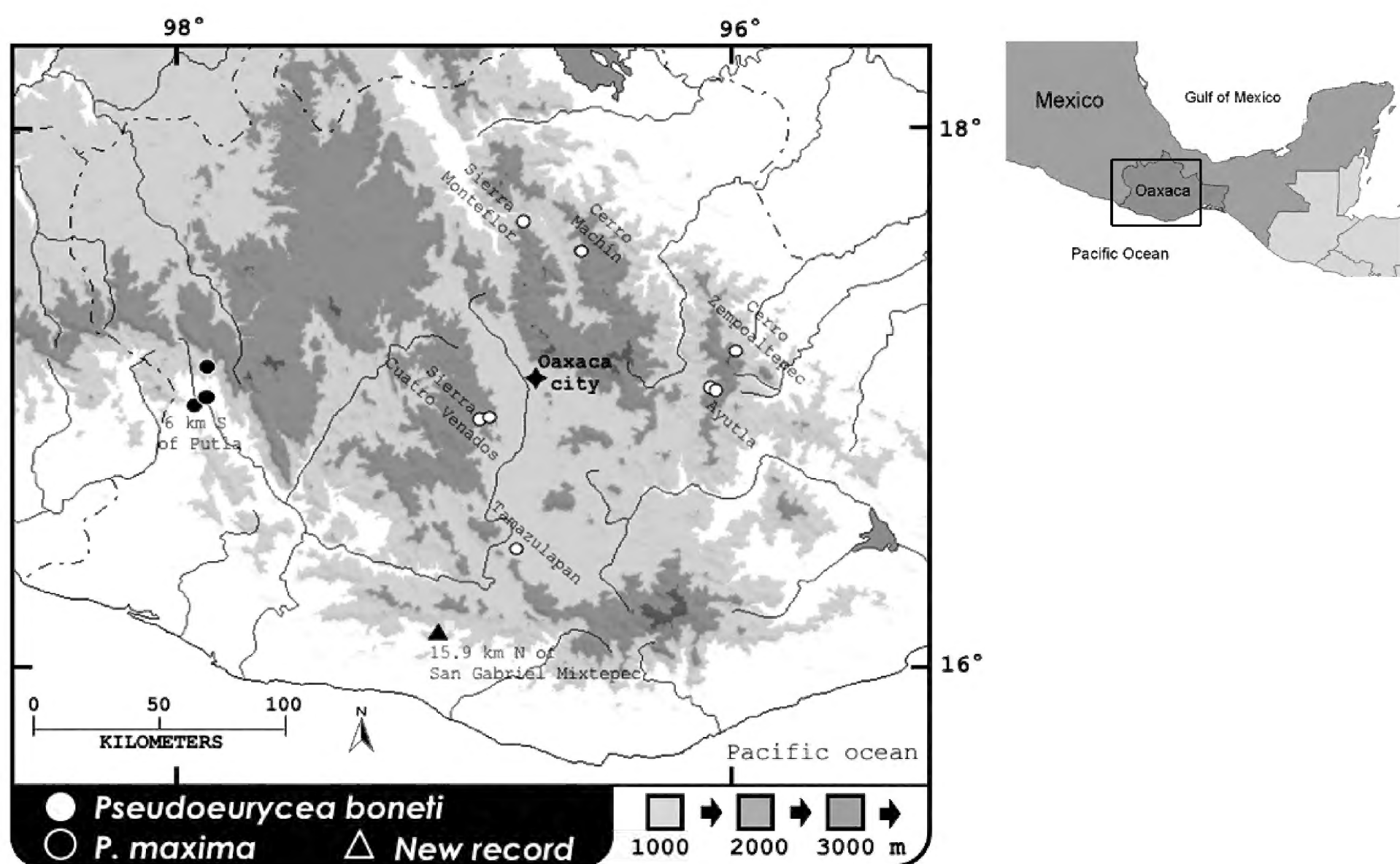
These distribution patterns are somewhat expected considering the geographic patterns of other amphibian groups and the topographical and ecological isolation that characterize much of Mexico and Guatemala. However, it is also likely that many range projections are significantly underestimated, given the void in our current knowledge of species' distributions. Herein we present new geographic information on *Pseudoeurycea maxima* (Parra-Olea, García-París, Papenfuss & Wake, 2005), a species of the *P. bellii* complex, extending its range by ca. 130 km east-southeast from previously known locations.

Specific locations and elevations were calculated by marking road mileage to the nearest town and by using a Kestrel 4000 field barometer, and then checked to a physical map with the software Global Mapper. Additional localities for *P. maxima* and *P. boneti* were obtained from the Museum of Vertebrate Zoology (MVZ, University of California, Berkeley). Habitat type/quality was examined using satellite projects on Google Earth. Voucher photos were deposited at the University of Texas Arlington, Arlington, Texas, U.S.A.

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*Pseudoeurycea maxima* is registered from several localities just south and northeast of Putla de Guerrero, Oaxaca, Mexico, at 750–1,030 m elevation along the Pacific versant of the Sierra Madre del Sur (Figure 1). On 09 June 2007 at 04:30 AM, an adult *P. maxima* (Figure 2) was observed active among leaf litter on the forest floor. This was along a narrow roadside ravine through a small patch of mature secondary forest, 15.9 km north of San Gabriel Mixtepec (16°05'40"

N, 97°04'55" W), on the Oaxaca-Puerto Escondido road (HW 131), at an elevation of 1,086 m on the Pacific versant of southern Oaxaca (Figure 1). The forest type is classified as Lower Montane Dry Forest (LMDF), which has a pronounced rainy season from May through October (for thorough descriptions, Stuart 1966; Caldwell 1974). This new record is approximately 130 km east-southeast from registered localities of the species.



**Figure 1.** Registered localities of *Pseudoeurycea boneti* and *Pseudoeurycea maxima* in Oaxaca, Mexico.

While some members of the *Pseudoeurycea bellii* group exhibit strong elevation/vegetation associations (e.g. *P. boneti*, *P. gigantea*, and *P. naucampatepetl*), another (*P. bellii*) is reported as having both the widest distributional and elevation limits of any salamander in the world, occurring in a wide variety of habitats (Feder et al. 1982; Parra-Olea et al. 2005). However, all specimens from low elevations reported in Feder et al. (1982)

as *P. bellii* are now recognized as members of other taxa, including *P. maxima* (see Parra-Olea et al. 2005). Based on available information, it appears that *P. maxima* is associated with the LMDF formation, occurring within the elevational extent of this vegetation type. It is likely that this species occurs further east-southeast and west-northwest along the Pacific versant of Oaxaca and into Guerrero, following this LMDF.



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**Figure 2.** Adult *Pseudoeurycea maxima* located on 09 June 2007, near San Gabriel Mixtepec, Oaxaca, Mexico. Photo by J. Delia.

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The current conservation status of *P. maxima* is listed by the IUCN as Data Deficient, with the possibility of qualifying it as Least Concern if its area of occupancy is more widespread than currently registered (IUCN 2007). While large expanses of LMDF have suffered alteration, with an increasing area subject to deforestation, large tracks of forest remain intact within the area occupied by this species. In addition, this species has been documented in altered areas like road cuts, banana plantations (Parra-Olea et al. 2005), and in fragmented secondary forest (this work).

Considering the increased area of occupancy, potential extent of occurrence, and its ability to tolerate disturbance, we recommend that *P. maxima* qualifies for the IUCN category of Least Concern. However, as this species was only recently described (2005), information on its population trends are non-existent, which could contribute a high degree of uncertainty in evaluating its conservation status. Therefore, future efforts are needed to evaluate population trends and better detect the occurrence of this species outside of its known range.

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